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OUTPUT PER MAN-HOUR IN FOOD MANUFACTURING 1/

Output per man-hour for all employees in factories processing farm food products increased about 56 percent from 1947-49 to 1963, according to preliminary estimates (table 13). 2/ Thus, only about two-thirds as many man-hours as were needed a decade and a half ago were required per unit of output in 1963; and the current product "mix" includes a much larger variety of products with more processing services per unit. Except for a slight decline in 1948, output per man-hour increased in each of the 16 years since 1947.

Output of factories processing farm foods increased 45 percent from 1947-49 to 1963 (preliminary estimate). Except for a small decrease in 1948 and no change in 1957, output increased every year from 1947 to 1963. The somewhat greater increase in output per man-hour resulted in a 7 percent decline in man-hours worked in food manufacturing from 1947-49 to 1963.

The average annual rate of growth in output per man-hour has varied for individual industry groups (table 14). The average annual rate of growth of output per man-hour for all food processing was 3.3 percent for the postwar period, 1947-63, as a whole. The industries showing faster-than-average rates of growth were sugar products (4.7 percent), processed fruits and vegetables (3.8 percent), and manufactured dairy products (3.4 percent). Those showing below-average rates of growth were bakery products (1.6 percent), confectionery products (2.4 percent), grain-mill products (3.1 percent), and meat products (3.1 percent). The annual data on output per man-hour show a fairly constant rate of change over the 16 postwar years. That is, the index of output per man-hour shows no apparent accelerated or decelerated rates of change.

The sugar and the processed fruits and vegetables industries, which experienced the largest rates of growth in output per man-hour, also experienced the largest average rates of growth in output. Dairy products and grain-mill products, which showed among the smallest yearly rates of increase in output, also exhibited comparatively large rates of growth in output per man-hour. However, bakery products, which had a substantially smaller rate of growth in output per man-hour than any other, did not experience the smallest gains in output. In sum, the divergent trends indicate that the faster growing industries experienced faster rates of growth in labor productivity, but that the slower growing industries did not necessarily experience small gains in labor productivity. Despite the divergent trends in output and labor productivity among industry groups, each group experienced a decline in the number of man-hours worked.

1/ Prepared by William H. Waldorf, agricultural economist, and Edward A. Cohn, economic assistant, Marketing Economic Division, Economic Research Service. Index numbers used in this article were developed as part of a broad investigation of changes in productivity of resources employed in marketing domestic farm food products. A more comprehensive report, including a discussion of methods, sources, and limitations of the indexes, has been published in Output Per Man-Hour in Factory Processing of Farm Food Products, by William H. Waldorf, Tech. Bul. 1243, ERS, U.S. Dept. Agr. Washington, D.C., May 1961.

2/ Series used in this article are for manufacturing establishments primarily engaged in processing domestically produced farm food products--except fluid milk, cream and eggs, including factory processing of farm foods for export, for the Armed Forces, and Government purchases used in various relief programs, as well as food for sale to civilian consumers. Factory processing of imported foods, seafoods, and other foods not produced on domestic farms and manufacture of alcoholic and nonalcoholic beverages are excluded.

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Table 13.--Factory output, man-hour and output per man-hour in manufacturing farm-originated foods, industry groups, United States 1947-63 1/
(1947-49=100)

Year	All foods 2/			Meat products 3/			Manufactured dairy products 4/			Processed fruits and vegetables 5/		
	Output	Man-hours	Output per man-hour 6/	Output	Man-hours	Output per man-hour 6/	Output	Man-hours	Output per man-hour 6/	Output	Man-hours	Output per man-hour 6/
1947	101	102	100	105	102	103	105	109	97	97	103	93
1948	98	100	99	96	98	98	98	100	97	99	100	99
1949	100	99	101	99	100	99	97	91	106	104	97	107
1950	103	100	103	101	100	101	95	96	98	106	98	108
1951	106	102	104	100	104	97	91	90	101	124	107	115
1952	108	103	105	105	105	100	91	88	104	122	102	119
1953	112	7/97	7/115	113	7/102	7/111	96	7/90	7/106	129	7/98	7/131
1954	113	97	117	116	101	115	96	83	115	128	97	132
1955	117	98	119	125	103	120	98	84	117	135	98	137
1956	124	100	123	130	107	122	102	83	122	151	102	149
1957	124	98	126	124	101	124	103	82	126	144	103	140
1958	126	8/95	8/132	118	8/94	8/126	104	8/75	8/138	146	8/102	8/143
1959	131	96	137	127	94	136	107	75	142	151	98	154
1960	134	96	139	131	93	141	109	78	139	156	100	155
1961	138	95	146	133	90	147	113	77	146	167	101	166
1962	143	95	151	135	89	152	115	74	155	181	101	179
1963	145	93	156	142	88	161	114	72	159	166	95	174

Data for 1959-63 are preliminary.

1/ Man-hour indexes based on all employees and hours worked; figure for 1948 interpolated from Bureau of Labor Statistics data on all employees and hours paid for.

2/ Includes poultry dressing plants and establishments primarily engaged in manufacturing leavening compounds, shortening and cooking oils, margarine, corn wet milling products, flavorings, macaroni and spaghetti, and peanut butter, as well as industry groups shown in this table. Except for sugar, series include food manufacturing in Alaska and Hawaii since 1958.

3/ Includes meatpacking plants and establishments specializing in prepared meat products.

4/ Includes establishments primarily engaged in manufacturing creamery butter, natural cheese, concentrated milk, ice cream and ices, and special dairy products; it excludes processing of fluid milk and cream.

5/ Includes establishments primarily engaged in manufacturing canned fruits and vegetables, dehydrated fruits and vegetables, pickles and sauces, and frozen fruits and vegetables.

6/ Computations for production per man-hour are based on unrounded figures.

7/ Census Bureau revised sampling plan and universe in Annual Survey of Manufactures beginning in 1953 which somewhat offsets comparability of man-hours and output per man-hour series with earlier years.

8/ All industry groups, except sugar, cover Alaska and Hawaii, starting with 1958. Post 1958 years have been made comparable with earlier years.

Continued--

Table 13.--Factory output, man-hour and output per man-hour in manufacturing farm-originated foods, industry groups, United States, 1947-63 1/ Continued--
(1947-49=100)

Year	Grain-mill products 9/			Bakery products 10/			Sugar 11/			Confectionery 12/		
	Output	Man-hours	Output per man-hour 6/	Output	Man-hours	Output per man-hour 6/	Output	Man-hours	Output per man-hour 6/	Output	Man-hours	Output per man-hour 6/
1947	106	104	102	99	98	100	109	113	96	100	99	101
1948	102	100	102	100	100	100	91	96	95	102	102	100
1949	92	96	96	102	101	100	100	91	109	99	99	99
1950	91	95	96	103	101	102	122	102	119	105	105	100
1951	95	95	100	106	105	101	92	96	96	101	88	114
1952	96	105	92	111	107	104	96	93	103	102	92	110
1953	95	7/91	7/104	106	7/97	7/109	109	7/100	7/109	102	7/87	7/117
1954	96	84	115	105	97	108	118	85	138	97	85	114
1955	96	87	111	107	99	108	103	80	128	95	86	110
1956	100	84	119	111	100	110	112	78	144	98	88	111
1957	103	80	129	114	100	114	122	80	151	103	85	122
1958	107	8/78	8/136	118	8/99	8/120	124	8/83	8/149	105	8/83	8/126
1959	109	81	135	120	101	119	132	83	159	109	83	132
1960	111	81	138	121	101	119	137	82	168	112	83	136
1961	113	80	142	120	99	121	145	84	170	116	83	139
1962	114	79	145	123	99	124	153	79	191	117	84	138
1963	118	79	149	125	98	127	158	79	200	122	85	143

Data for 1959-63 are preliminary.

9/ Includes establishments primarily engaged in manufacturing flour and meal, cereal products, rice milling, and blended and prepared flour.

10/ Includes establishments primarily engaged in manufacturing biscuits and crackers, wholesale bakeries, grocery chain bakeries, house-to-house bakeries, and retail multi-outlet bakeries (excluding those with direct sales to consumers on premises). In 1954, establishments which were part of a chain and were producing for direct sale on premises were reclassified from the Census of Manufactures to the Census of Retail Trade; however, this did not significantly affect comparability of the series between 1947 and 1954. Establishments which bake primarily for direct sale to consumers are not included.

11/ Includes establishments primarily engaged in manufacturing raw cane sugar from domestically grown sugarcane (except Hawaii) and plants mainly engaged in production of beet sugar. The index of raw cane sugar also includes an adjustment for refining domestic cane sugar, except for Hawaiian sugar.

12/ Includes establishments primarily engaged in manufacturing candy and other confections.

Table 14.--Average annual percentage change in output, man-hours, and output per man-hour in manufacturing farm-originated foods, United States, 1947-63 1/

Industry group	Output	Man-hours	Output per man-hour
	Percent	Percent	Percent
All farm foods	2.3	-1.0	3.3
Meat products	2.6	-0.5	3.1
Dairy products	1.1	-2.2	3.4
Fruits and vegetable products	3.7	-0.1	3.8
Grain mill products	1.2	-1.8	3.1
Bakery products	1.5	-0.1	1.6
Sugar products	3.5	-1.1	4.7
Confectionery products	1.1	-1.3	2.4

1/ Based on data in table 13.

Comparison With Other Sectors 3/

The average annual rate of growth in output per man-hour between 1947 and 1963 was about the same in factories processing farm foods (3.3 percent) as in the total private sector of the economy (3.2 percent). The rate in food processing, however, was substantially larger than the rate in the private non-farm sector (2.6 percent), which includes manufacturing, trade, and service industries.

Output per man-hour in agriculture grew at an average yearly rate of 5.7 percent during the postwar period, considerably greater than in food manufacturing. The dramatic rate of growth of output per man-hour in agriculture reflects, among other things, a large substitution of capital for labor. The increase was considerably larger than the rise in total capital per worker in food manufacturing.

Factors Affecting Output Per Man-Hour

The postwar rise of output per man-hour in factory processing accompanied an increase in the stock of total capital per worker. However, technological improvement in capital goods probably was the most important single factor contributing to the growth in output per man-hour. Technological innovations in materials handling, continuous processes, electronic temperature and humidity controls, packaging, grading, and other developments have made a dramatic impact on output per man-hour. Development of frozen foods and other new products in which output per man-hour either is higher, or is rising faster than the average for all processed foods, also contributed to the overall increase in output per man-hour.

Increases in the "quality" of labor inputs through education, training, experience, and other kinds of investment in human capital also added substantially to the growth in output per man-hour. Economies of scale probably also contributed significantly to the postwar growth in output per man-hour.

3/ The average annual rates of growth of output per man-hour worked by all employees in the private employees in the private economy, in agriculture, and in the private nonagricultural sector were computed from Bureau of Labor Statistics annual estimates reported in Trends in Output Per Man-Hour in the Private Economy, 1909-58, BLS Bul. 1249 (1959), and supplements to that bulletin. All average annual rates of growth presented in this article were obtained by fitting exponential curves by least squares (Glover's method) to annual data.